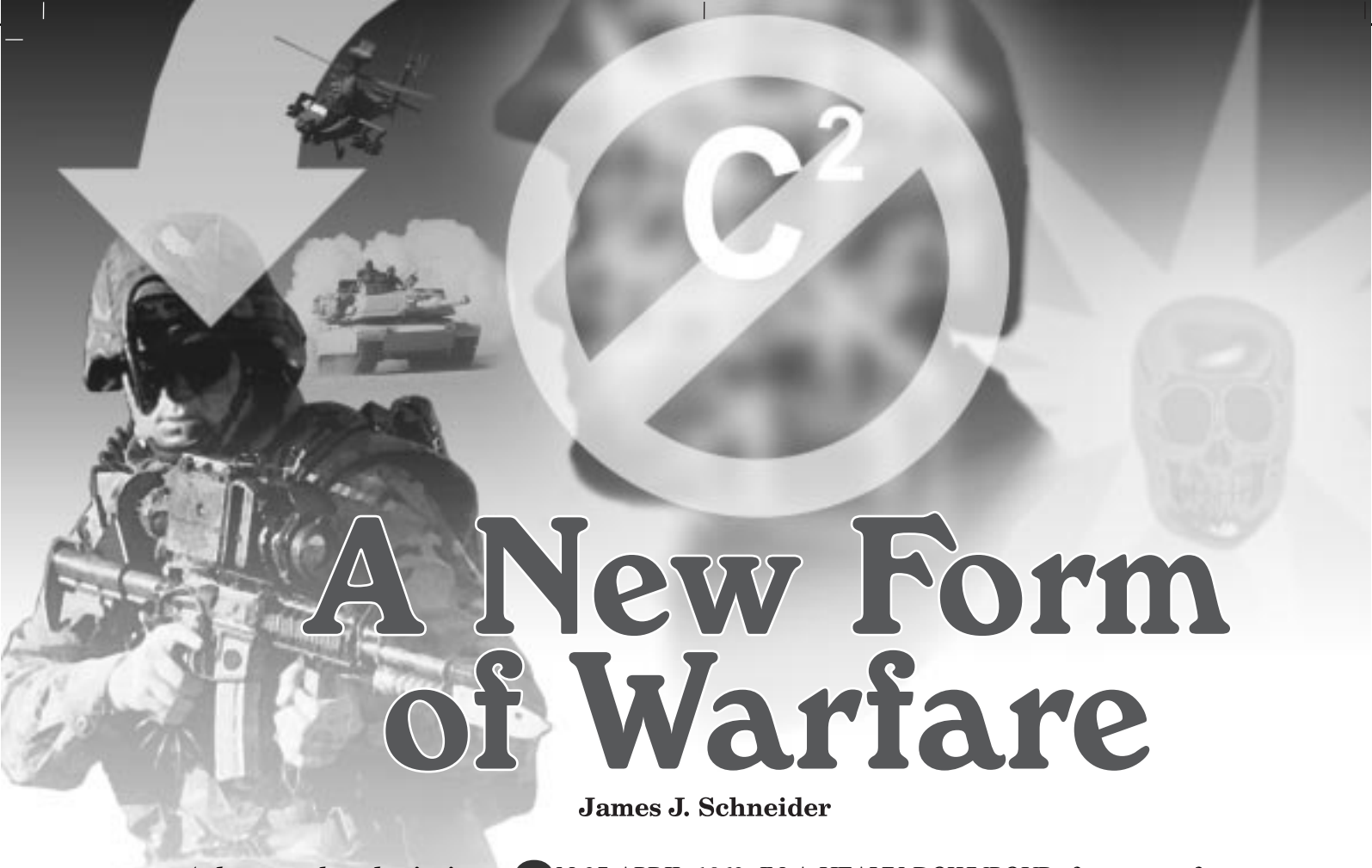

A New Form of Warfare

James J. Schneider

***As horses and mechanization revolutionized maneuver and industrialization geometrically advanced firepower, information technology is transforming communications, command and control. James Schneider argues that degrading an enemy's command and control paralyzes its military force as surely as successful maneuver exhausts it and a strategy of attrition aims at annihilation. Schneider outlines this third form of warfare, relates its historical roots, explains its current applications and calls it* cybershock.**

ON 27 APRIL 1863, IN A HEAVY DOWNPOUR, four corps of Major General Joseph Hooker's Federal Army of the Potomac began the first operational maneuver in military history. Thanks to the employment of the Beardslee field telegraph, a large portion of his army moved off the battlefield before Chancellorsville. General Robert E. Lee, past master of Napoleonic warfare, was "temporarily baffled" by the strange Union maneuver.[1] But five days later, at Lee's direction, Thomas J. "Stonewall" Jackson thwarted it. Jackson's blow to Hooker's army was also unique in that it was perhaps the first instance in military history where a force was defeated by *cybershock*, the systemic paralysis of an army through its inability to direct and control itself effectively.

Understanding the concept of cybershock is important because it offers a conceptual structure to elevate the disparate notions of command and control warfare (C^2W) and information operations (IO) to the same level as maneuver and attrition. Indeed, this article argues that cybershock is a new kind of defeat mechanism wholly analogous to, but distinct from, attrition and maneuver. Historically, cybershock evolved in the wake of the emergence of operational art. Only now with the current emphasis on information operations has the Army begun to seriously consider the practical and revolutionary implications of cybershock as a new form of offensive and defensive action.

Delbrück's Cut

In 1900 German military historian Hans Delbrück published the first of four volumes in *History of the Art of War within the Framework of Political History*.[2] The project embraced the history of warfare from the Persian Wars around 500 B.C. to the end of the Napoleonic Wars in 1815. Toward the end of his study, Delbrück concluded that the whole history of warfare could be expressed by two patterns of defeat. The first pattern he called a strategy of annihilation (*Niederwerfungstrategie*);

the second, a strategy of exhaustion (*Ermattungstrategie*). Annihilation aimed at the destruction of the enemy's army through a decisive battle. Here the dominant mechanism of defeat was attrition. Exhaustion, on the other hand, sought the enemy's moral and logistical collapse through a combination of battle *and maneuver*.[3]

Building on an initial insight from Carl von Clausewitz, Delbrück noted that employing a particular strategy depended on the military means available and the political purpose for which the war was being waged.[4] A strategy of annihilation was appropriate for a war fought for unlimited aims with unlimited means; a strategy of exhaustion was a war fought for limited aims with limited means. Most often the selection of war aims became a function of the perceived domination of one side over another. A perceived deficit in military means, Delbrück believed, drove the weaker side to adopt exhaustion, the stronger side to seek annihilation. The correlation of forces, furthermore, entailed a particular force posture. A strategy of exhaustion, implying weakness, suggested a defensive posture since defense is the stronger form of war. A strategy of annihilation implied strength and suggested the weaker but more decisive offensive posture.[5]

The Heat of Battle

Delbrück's framework enumerated the two defeat patterns that had dominated military history until the Industrial Revolution. For thousands of years annihilation found its tactical expression through attrition in the techniques of the old armies based on physical shock. Beginning around the 17th century, the increasing use of firearms required permanent bases of operations. The emerging logistical importance of the base of operations created a new geometric relationship in a theater of operations among the base of operations, lines of operations and objective point. This relationship for the first time gave rise to *maneuver* as a viable and second method of defeat.

Maneuver, movement to achieve or deny positional advantage over an opponent, exploited the new theater geometry and logistics of new firepower-based armies, since positional advantage was most often sought against the adversary's line of operations. The ensuing maneuver and counter-maneuver led to a kind of *danse macabre* punctuated with mutual embraces of battle. The dynamics of maneuver and battle led inexorably to logistical exhaustion and suggested an underlying physical mechanism for annihilation and exhaustion in pre-industrial armies.

In *On War* Clausewitz asks a fundamental question: "What usually happens in a major battle today?" He replies, "the first thing to strike one's imagination, and indeed one's intellect, is the melting away of numbers. . . . The battle slowly smolders away, like damp gunpowder. . . . Gradually, the units engaged are burned out, and when nothing is left but cinders, they are withdrawn . . . like burned-out cinders."[6] One can extend Clausewitz's evocative metaphor to gain insight into the essential physics of classical battle. *Armies in battle burn, melt and vaporize*. The heat of battle is calibrated in the temperature of casualties. Armies enter battle in a solid state of cohesion, like a block of lead. The heat and energy of combat attrition may be so great as to vaporize instantly the entire mass in a battle of annihilation and cause a great disintegration of morale and will to fight. The combination of attrition and maneuver may slow the process with an intervening "liquid" phase of logistic collapse before the army is swept away in a disintegrated cloud of human ash and iron debris.

"Gradually, the units engaged are burned out," said Clausewitz, "and when nothing is left but cinders, they are withdrawn . . . like burned-out cinders." One can extend Clausewitz's evocative metaphor to gain insight into the essential physics of classical battle. **Armies in battle burn, melt and vaporize.**

But by the end of the American Civil War, the essential physics of war would undergo a profound change and constitute the world's second Revolution in Military Affairs (RMA).

The Industrial Revolution and the Complexity of Warfare

The "complexification"—to use John Casti's term—of 19th-century armies was ultimately the consequence of entirely new technologies.[7] The armies of the pre-Industrial period evolved in train with the simple machines invented during the Agricultural Revolution (8,000-3,000 B.C.). These simple machines—the lever, wedge, wheel and axle, pulley and screw—can be characterized as point technologies because of how they focus or leverage mechanical force at a single point. Clausewitz made a similar observation concerning Napoleonic warfare of his own day. He wrote that in battle "all action is compressed into *a single point* in space and time."[8] In contrast, technologies of the Industrial Revolution were dominated by innovations in distributed technology. The steam engine, the railroad, the telegraph, the dynamo, nitro-based explosives and the magazine rifle all changed the geometry of warfare from action compressed into a single point to action distributed in breadth and depth. Fundamentally, this distribution transformed the simple armies of Napoleon into modern armies of great complexity.

Cybershock in warfare causes paralysis by attacking the enemy's nervous system in the same way that maneuver causes exhaustion by defeating the opponent's metabolic system — his logistics. . . . Cybernetic paralysis drives an organized system into disorganization by destroying the coherence, connection and flow of information among the component parts of a complex system.

Complexity theory tells us that the pre-Industrial armies of physical shock and fire action were rather *simple*, perhaps even *complicated*, military systems. On the other hand, a *complex* system such as the modern army that appeared in the wake of the Industrial Revolution is a "network of many 'agents' acting in parallel. . . . The control of a complex adaptive [learning] system tends to be highly dispersed. . . . A complex adaptive system has many levels of organization . . . [which] are constantly revising and rearranging their building blocks as they gain experience. . . . All these processes of learning, evolution, and adaptation are the same. . . . All complex adaptive systems anticipate the future."[9] The various aspects of complexity all turn on the way a complex adaptive dynamic system uses information.

A modern complex military system uses information in five ways. The first is the manner in which it uses information to describe itself and its enemy. The more information required to describe itself and an adversary, the more descriptively complex this relationship is. Second, a complex military system uses information to organize itself. Indeed, organization is a process that structures information. The increase in organizational complexity itself creates more information. Third, after the Industrial Revolution armies became algorithmically complex—the number of tasks or steps necessary to defeat an enemy increased dramatically. The size of planning staffs grew beginning in the Civil War and modern war became increasingly protracted. The emergence of operational art during this period was another consequence of the algorithmic complexity of modern armies. Wars could no longer be won with a few battles. Instead, commanders and staffs had to design and execute a whole complex mosaic of deep, extended operations to defeat an adversary.

Fourth, information acquisition became more complex. No longer could the commander sit upon his horse, gaze out on the battlefield and simply apprehend all the information in one unfolding battle. Everything became hidden: the commander and his staff actively had to seek out information on countless battlefields throughout the theater of operations. Finally, complex military systems became cybernetically complex: greater information was required to direct and control the industrial armies. In this new environment messages had to travel faster than their messengers.

National Archives

Field telegraphers of the Military Telegraph Corps at an advanced position. The soldier in the background at right operates a hand-cranked generator mounted in a wagon.

The Messenger and the Disembodied Word

Imagine if your body—a complex adaptive system—controlled itself using nerve impulses traveling at the speed of a galloping horse instead of the speed of an electron. Clearly your body would fail and die. Or imagine if the speed of mental activity that gives rise to rational thought moved at the speed of a messenger instead of the speed of light. The simple armies of the pre-Industrial epoch controlled themselves in just such a fashion. Soon electrons replaced messengers on horseback. The invention of the telegraph solved the greatest command and control question of military history: How could information flow faster than a messenger could travel? The solution was simple: detach the message from the messenger, encode it and send it along a copper wire at near the speed of light. This disembodied message further enabled distributed forces across a theater of operations.

Hooker's attempt to exploit this new technology at Chancellorsville quickly demonstrated that the new freedom of complexity also created a new vulnerability to the danger of paralysis. As complex military systems emerged, they created a whole new pattern of defeat, placing cybershock and paralysis on par with attrition and annihilation and maneuver and exhaustion. The cybershock-paralysis defeat pattern does not replace or compete with the other two, however. Instead, cybershock supplements and complements attrition and maneuver. Cybershock induces deep systemic paralysis throughout a complex military system, culminating the transformation in warfare first wrought by the Industrial Revolution more than 100 years ago.

How Cybershock Works

Unfortunately, today's RMA debate trivializes the profound influence of the Industrial Revolution, which spawned such complex systems as the nation-state, free market economy, distributed armies and extended societies—all held together by a velocity of information exchange

Hooker's attempt to exploit this new communications technology at Chancellorsville quickly demonstrated that the new freedom of complexity also created a new vulnerability to the danger of paralysis. As complex military systems emerged, they created a whole new pattern of defeat, placing cybershock and paralysis on par with attrition and annihilation and maneuver and exhaustion.

The promises of information technology demand vigilant scrutiny, for military systems are rarely destroyed by paralysis alone.

unheard of before. The complexification of the world created a new kind of vulnerability that cybershock has since sought to exploit, a vulnerability to systemic paralysis. The actions of all complex systems are controlled and modulated by the reliable free flow of information and energy. Cybershock in warfare causes paralysis by attacking the enemy's nervous system in the same way that maneuver causes exhaustion by defeating the opponent's metabolic system—his logistics.

Cybershock creates paralysis in five ways. First, through the use of operations security (OPSEC), deception operations and psychological operations (PSYOP), the enemy is denied complete information of both his adversary and himself.[10] Second, active and intense reconnaissance blinds the enemy and becomes the most critical element in the struggle for information. Third, the shock of surprise places a tremendous burden on the enemy's military nervous system as it creates a broad state of panic. Fourth, today's electronic warfare (EW) destroys the organizational coherence and cohesion of the target, essentially inducing a kind of epileptic seizure in the opponent's nervous system. Finally, the activeness and rapidity of friendly operations induce a kind of cybernetic stupor in the enemy: his entire nervous systems goes into overload and general dissonance sets in. Because he does not know what to do, the enemy does not act. Paralysis and disorganization are complete: the enemy's army has been reduced to its component parts, an army only in name. New technology allows us to attack the enemy's nervous system directly with electrons instead of bullets.

It would be a serious error to imagine that one could defeat an enemy through paralysis alone. All three patterns of warfare are complementary and mutually reinforcing. The synergism among them thus creates an integrated system of attack and defense designed to destroy a complex military system. Attrition, maneuver and cybershock together cause disruption (see figure).

The final outcome in this relationship is disintegration and the destruction of the will to fight. Failure to consider the modern patterns of war in their totality can only lead to defeat. In particular, the promises of information technology demand vigilant scrutiny, for military systems are rarely destroyed by paralysis alone. One of the remarkable qualities of complex military systems is that they are *self-organizing*.

Black Lights: the Paradox of Self-Organization

There is an interesting paradox in the realm of boxing. Sometimes a boxer may receive a hard shot to the head that causes an immediate knockout. Some boxers report seeing "black lights" before sinking into oblivion; they see and become surrounded by a shimmering, glowing aura of darkness. Such boxers experience the paradox of being conscious of their unconsciousness. Some boxers are able to recover and continue to fight after this interval of conscious unconsciousness because higher cognitive centers of the brain residing in the neocortex shut down, but the lower areas of the brain, called the limbic system, kick in and preserve a primitive sense of awareness. A similar phenomenon occurs in modern armies and calls into question the ultimate utility of information warfare.

Cybernetic paralysis drives an organized system into disorganization by destroying the coherence, connection and flow of information among the component parts of a complex system. However, a complex system is one in which "a great many independent agents are interacting with each other in a great many ways. . . . The very richness of these interactions allows the system as a whole to undergo *spontaneous self-organization*. . . . These complex, self-organizing systems are *adaptive,*

in that they . . . actively try to turn whatever happens to their advantage. . . . Finally, every one of these complex, self-organizing, adaptive systems possesses a kind of dynamism that makes them quantitatively different from static objects. . . . Complex systems [like armies in battle] are more spontaneous, more disorderly, more alive."[11] Sun Tzu, the ancient Chinese philosopher of war, noted the same phenomenon. He wrote, "In the tumult and uproar the battle seems chaotic, but there is no disorder; the troops appear to be milling about in circles but cannot be defeated. . . . Apparent confusion is a product of good order."[12] Elsewhere, Ralph Waldo Emerson writes, "War disorganizes, but it is to reorganize."[13]

These writers have highlighted a fundamental characteristic of modern war: that overall systemic paralysis and disorganization can be offset, up to a certain point, by self-organization and reorganization at lower levels of command. The German notion of *auftragstaktik,* for example, is based on the self-organizing ability of tactical units and local commanders. It is important, therefore, to note how military systems and other self-organizing complex systems differ from biological systems. For biological systems like the human body, paralysis is total in the sense that a person with a broken neck does not experience a sudden self-organization and control of his limbs. An army, on the other hand, may suffer complete cybernetic collapse—the analogue to a broken neck—but spontaneously reorganize at lower echelons of command and continue on with its mission.

For biological systems like the human body, paralysis is total in the sense that a person with a broken neck does not experience a sudden self-organization and control of his limbs. An army, on the other hand, may suffer complete cybernetic collapse — the analogue to a broken neck — but spontaneously reorganize at lower echelons of command and continue on with its mission.

The implications of self-organization should be apparent: the final defeat of a disorganized enemy may depend ultimately on his physical and protracted destruction in detail. If an enemy still has the will to fight, his fate will have to be decided with a simple bullet rather than a complicated piece of hardware or an elaborate scheme of maneuver. Such campaigns as Iwo Jima and Okinawa should remind us how rare—and sweet—victories such as the Gulf War are. In the end there are few shortcuts to victory, but there are many roads to defeat. A commander and planning staff exploring avenues to victory should remember the three historical categories: the integrated annihilation, exhaustion and paralysis of the enemy. ***MR***

NOTES

1. Vincent J. Esposito, ed., *The West Point Atlas of the American Wars* (New York: Praeger Publishers, 1959), vol. I, map 84.
2. Hans Delbrück, *History of the Art of War within the Framework of Political History*, 4 vols., translated by Walter J. Renfroe Jr. (Westport, CT: Greenwood Press, 1975-1985).
3. Ibid., 3, 369-31, 421-44. Also see Arden Bucholtz, *Hans Delbrück and the German Military Establishment* (Iowa City: University of Iowa Press, 1985), and Gordon A. Craig, "Delbrück: the Military historian," in Edward Meade Earle, *Makers of Modern Strategy* (Princeton, NJ: Princeton University Press, 1943), 260-83.
4. Carl von Clausewitz, *On War,* translated by Michael Howard and Peter Paret (Princeton, NJ: Princeton University Press, 1976), 69.
5. Ibid., 357-92, 484-519, 523-73.
6. Ibid., 226, 231, 254.
7. John L. Casti, *Complexification* (New York: HarperCollins, 1994). Also see M. Mitchell Waldrop, *Complexity* (New York: Simon and Schuster, 1992).
8. Clausewitz, 259, with Clausewitz's emphasis.
9. Waldrop, 145-47.
10. R. Dan Grymes, "Command and Control Warfare in Forced Entry Operations," *SAMS Student Monograph* (Fort Leavenworth, KS: USACGSC, 1995), 1-2.
11. Waldrop, 11-12.
12. Sun Tzu, *The Art of War,* trans. Samuel B. Griffith (Oxford University Press, 1963), 92.
13. Ralph Waldo Emerson, as cited in R.H. Debs Jr., *Dictionary of Military and Naval Quotations* (Annapolis, MD: Naval Institute Press, 1966), 346. I am indebted to LTC Russ Glenn for this citation.

James J. Schneider is a professor of military theory at the School of Advanced Military Studies, US Army Command and General Staff College, Fort Leavenworth, Kansas. He received a B.A. and an M.A. from the University of Wisconsin at Oshkosh and a Ph.D. from the University of Kansas. He served as a tank commander in Vietnam with the 1st Infantry Division and as an operations research analyst with the US Army Combined Arms Operations Research Activity, Fort Leavenworth. His book The Structure of Strategic Revolution *was released in November 1994 and he is a frequent contributor to* Military Review.